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National Eutrophication Survey, Las Vegas, Nev.

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NATIONAL EUTROPHICATION SURVEY

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REPORT
ON
ELEPHANT BUTTE RESERVOIR
SIERRA AND SOCORRO COUNTIES
NEW MEXICO
EPA REGION VI
WORKING PAPER No. 821

WITH THE COOPERATION OF THE
NEW MEXICO ENVIRONMENTAL IMPROVEMENT AGENCY
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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT ON ELEPHANT BUTTE RESERVOIR

SIERRA AND SOCORRO COUNTIES, NEW MEXICO

EPA REGION VI

by

National Eutrophication Survey

Water and Land Quality Branch
Monitoring Operations Division
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Special Studies Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the New Mexico Environmental Improvement Agency for professional involvement, to the New Mexico National Guard for conducting the tributary sampling phase of the Survey, and to those New Mexico wastewater treatment plant operators who provided effluent samples and flow data.

The staff of the Surveillance Section, Water Quality Division, New Mexico Environmental Improvement Agency provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

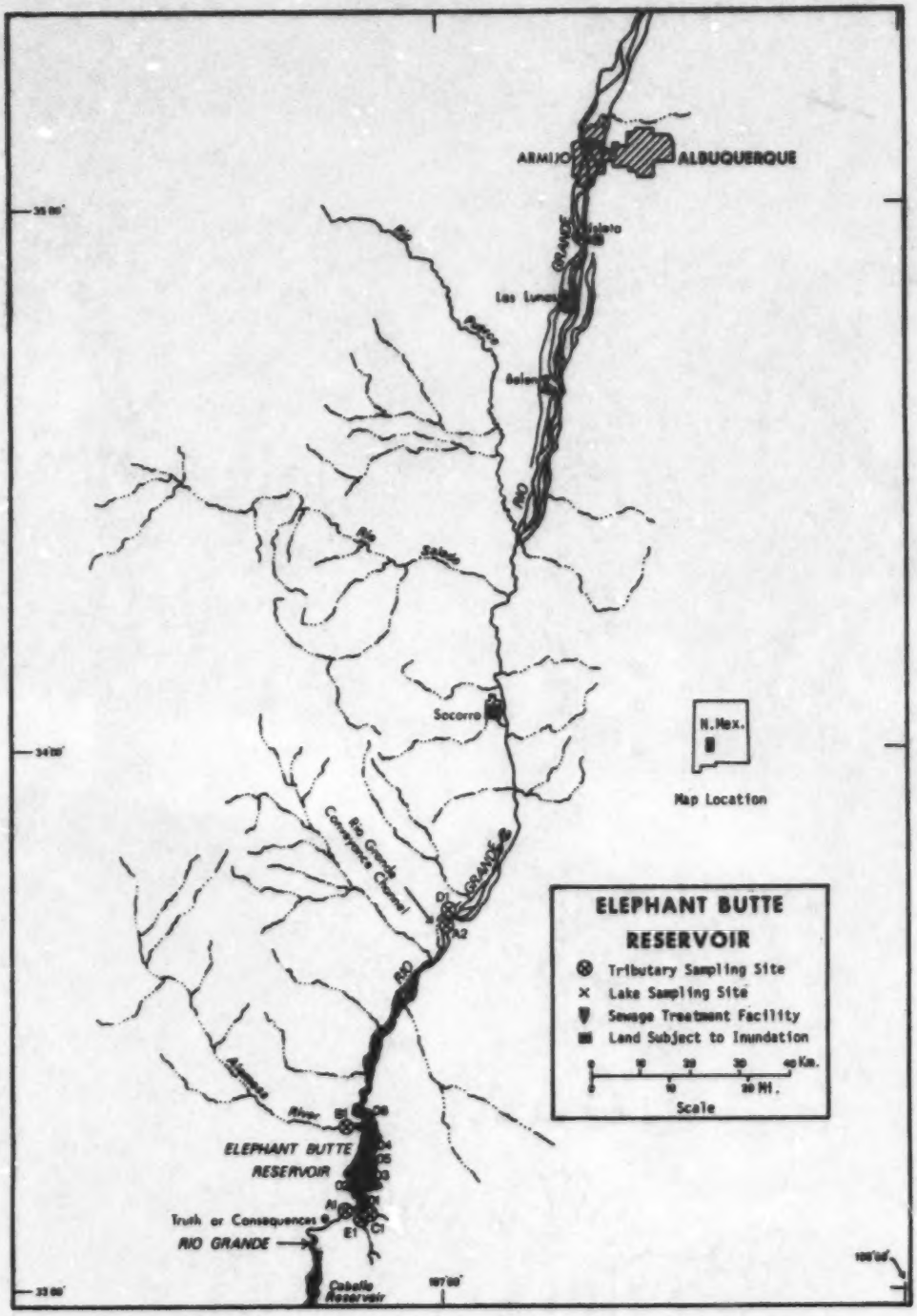
Brigadier General Franklin E. Miles, the Adjutant General of New Mexico, and Project Officer Colonel Marvin D. Bohannon, who directed the volunteer efforts of the New Mexico National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NEW MEXICO

LAKE NAME	COUNTY
Alamogordo Reservoir (Sumner Lake)	De Baca, Guadalupe
Bluewater Lake	Valencia, McKinley
Conchas Reservoir	San Miguel
Eagle Nest Lake	Colfax
Elephant Butte Reservoir	Sierra
El Vado Reservoir	Rio Arriba
Lake McMillan	Eddy
Ute Reservoir	Quay


ARMIJO
ALBUQUERQUE
RIO GRANDE
Los Lunas
Belen
Rio Puerco
Rio Salado
Socorro
N.Mex.
Map Location
Rio Grande Conveyance Channel
ELEPHANT BUTTE RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Land Subject to Inundation
0 10 20 30 40 Km.
0 10 20 Mi.
Scale
Alamosa River
ELEPHANT BUTTE RESERVOIR
Truth or Consequences
RIO GRANDE
Caballo Reservoir

REPORT ON ELEPHANT BUTTE RESERVOIR, NEW MEXICO

STORET NO. 3505

I. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate that Elephant Butte Reservoir is eutrophic, i.e., nutrient rich and potentially highly productive. Whether such nutrient enrichment is to be considered beneficial or deleterious is determined by its actual or potential impact upon designated beneficial water uses of the lake. In Elephant Butte Reservoir, biological response as measured by chlorophyll a values (range of 1.3 µg/l to 11.2 µg/l, mean of 6.8 µg/l) is more typical of that observed in mesotrophic water bodies.

Secchi disc visibility was poor; low transparencies (range of 0.1 to 1.2 m) suggest that much of the primary productivity in Elephant Butte Reservoir may have been light-limited, even though no clear-cut direct relationship was noted between light penetration and chlorophyll a levels. The potential for primary productivity as measured by algal assay control yields was high. Of the 9 New Mexico lakes (including Navajo Reservoir) sampled in 1975, 2 had higher median total phosphorus values (0.083 mg/l), 3 had higher median inorganic nitrogen levels (0.110 mg/l), and 1 had

*See Appendix E.

higher median orthophosphorus values (0.052 mg/l) than Elephant Butte Reservoir.

Survey limnologists reported an algal bloom on the October sampling date.

B. Rate-Limiting Nutrient:

The algal assay results indicate that nitrogen was the primary limiting nutrient in Elephant Butte Reservoir during the spring sampling (05/02/75) and phosphorus the primary limiting nutrient during the fall (10/03/75). The reservoir data suggest nitrogen limitation at all three sampling times. The New Mexico Environmental Improvement Agency (1976) also reports that the reservoir is generally limited primarily by available nitrogen but that a switch to phosphorus limitation does periodically occur.

C. Nutrient Controllability:

1. Point sources -

During the sampling year, point sources were calculated to contribute 21.0% of the total phosphorus load to Elephant Butte Reservoir. Albuquerque contributed a total of 20.2% from two plants, and the remaining 0.8% was contributed by three smaller plants along the Rio Grande. Phosphorus point source loadings to Elephant Butte Reservoir may be somewhat overestimated, since the known sewage treatment plants are located well outside 40 stream-km (25 miles) of the lake.

Additional investigation is needed to determine how much, if any, of the treatment plant loadings, particularly those from Albuquerque, are trapped in sediments or lost to groundwater before reaching Elephant Butte Reservoir.

The present phosphorus loading of 17.35 g $P/m^2/yr$ is 31 times that proposed by Vollenweider (1975) as a "eutrophic" loading. Although Vollenweider's model may not be applicable to highly turbid water bodies such as Elephant Butte Reservoir, phosphorus levels in the lake are nevertheless excessive and it is expected that lake water quality will deteriorate if the present loading continues. The New Mexico Environmental Improvement Agency (1976) has taken the position that reduction of nutrient contributions from the known point sources would not result in any tangible benefits to the reservoir at this time. They suggest that when future problem conditions in the reservoir necessitate limiting nutrient loading, that maximizing land application of the upstream municipal discharges would be an effective alternative to reduction of nutrients through advanced treatment procedures.

2. Nonpoint sources -

The Rio Grande contributed 78.8% of the total phosphorus load to Elephant Butte Reservoir during the sampling year. Other studies (New Mexico Environmental Improvement Agency, 1976) list agricultural runoff, high sediment loading and concentrated areas of septic tanks as major nonpoint sources of phosphorus to the lake.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below. Lake morphometry data were provided by Martin and Hanson (1966) and Tony Drypolcher (personal communication). Tributary flow data were provided by the New Mexico District Office of the U.S. Geological Survey (USGS). Outlet drainage area includes the lake surface area. Mean hydraulic retention time was obtained by dividing the lake volume by mean flow of the outlet. Precipitation values are estimated by methods as outlined in National Eutrophication Survey (NES) Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 148.05 km^2.
2. Mean depth: 18.3 meters.
3. Maximum depth: 47.9 meters.
4. Volume: 2,707.511 x 10^6 m^3.
5. Mean hydraulic retention time: 818 days (2.2 yr).

B. Tributary and Outlet:
(See Appendix B for flow data)

1. Tributaries -

Name	Drainage area (km^2)	Mean Flow (m^3/sec)
A-2 Rio Grande	71,742.9	37.07
B-1 Alamosa River	1,745.7	0.15
C-1 Unnamed Tributary	5.7	<0.01
E-1 Unnamed Stream	41.3	0.01
Minor tributaries and immediate drainage	2,589.6	1.08
Total	76,125.2	38.31

2b Outlet - A-1 Rio Grande 76,275.4 38.31

C. Precipitation:

1. Year of sampling: 23.4 cm.
2. Mean annual: 20.7 cm.

*Stations 03 and 04 were replaced by Stations 05 and 06 on the August and October sampling dates.

III. LAKE WATER QUALITY SUMMARY

Elephant Butte Reservoir was sampled three times during the open-water season of 1975 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from four stations on the lake* and from a number of depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 24.7 meters at Station 01, 22.9 meters at Station 02, 18.3 meters at Station 03, 9.4 meters at Station 04, 15.5 meters at Station 05, and 5.8 meters at Station 06. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix C and are summarized in III-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll a determinations are included in III-B. Results of the limiting nutrient study are presented in III-C.

*Stations 03 and 04 were replaced by Stations 05 and 06 on the August and October sampling dates.

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...ET CODE 3505

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	(5/ 2/75) S*** = 4 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(8/19/75) S*** = 4 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(10/ 3/75) S*** = 4 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)												
0.-1.5 M DEPTH	8	12.3- 14.0	13.0	0.0- 1.5	8	25.0- 26.3	25.6	0.0- 1.5	8	20.7- 21.6	21.0	0.0- 1.5
MAX DEPTH**	4	10.5- 12.9	11.1	9.4- 23.8	4	20.9- 24.5	22.7	5.8- 24.7	4	20.5- 20.7	20.5	3.0- 22.9
DISSOLVED OXYGEN (MG/L)												
0.-1.5 M DEPTH	8	7.6- 9.8	8.9	0.0- 1.5	8	5.8- 8.2	7.0	0.0- 1.5	8	5.4- 8.4	6.2	0.0- 1.5
MAX DEPTH**	4	6.6- 7.2	7.1	9.4- 23.8	3	0.8- 5.4	2.0	5.8- 19.2	4	5.4- 7.0	6.0	3.0- 22.9
CONDUCTIVITY (UMHOS)												
0.-1.5 M DEPTH	8	565.- 689.	587.	0.0- 1.5	8	621.- 667.	629.	0.0- 1.5	8	544.- 566.	549.	0.0- 1.5
MAX DEPTH**	4	573.- 719.	634.	9.4- 23.8	4	590.- 677.	605.	5.8- 24.7	4	544.- 681.	556.	3.0- 22.9
PH (STANDARD UNITS)												
0.-1.5 M DEPTH	8	8.6- 8.9	8.7	0.0- 1.5	8	8.4- 8.7	8.6	0.0- 1.5	8	7.8- 8.6	8.3	0.0- 1.5
MAX DEPTH**	4	8.4- 8.8	8.5	9.4- 23.8	4	7.6- 8.4	7.9	5.8- 24.7	4	8.0- 8.5	8.3	3.0- 22.9
TOTAL ALKALINITY (MG/L)												
0.-1.5 M DEPTH	8	149.- 164.	161.	0.0- 1.5	8	119.- 132.	123.	0.0- 1.5	8	127.- 132.	131.	0.0- 1.5
MAX DEPTH**	4	158.- 161.	160.	9.4- 23.8	4	127.- 136.	131.	5.8- 24.7	4	132.- 135.	133.	3.0- 22.9
TOTAL P (MG/L)												
0.-1.5 M DEPTH	8	0.048-0.111	0.091	0.0- 1.5	8	0.062-0.118	0.092	0.0- 1.5	8	0.078-0.098	0.083	0.0- 1.5
MAX DEPTH**	4	0.052-0.129	0.097	9.4- 23.8	4	0.102-0.203	0.164	5.8- 24.7	4	0.087-0.109	0.089	3.0- 22.9
DISSOLVED ORTHO P (MG/L)												
0.-1.5 M DEPTH	8	0.018-0.069	0.025	0.0- 1.5	8	0.032-0.062	0.046	0.0- 1.5	8	0.038-0.067	0.058	0.0- 1.5
MAX DEPTH**	4	0.023-0.043	0.030	9.4- 23.8	4	0.073-0.190	0.130	5.8- 24.7	4	0.050-0.128	0.060	3.0- 22.9
NO2+NO3 (MG/L)												
0.-1.5 M DEPTH	8	0.020-0.110	0.020	0.0- 1.5	8	0.020-0.100	0.030	0.0- 1.5	8	0.090-0.240	0.180	0.0- 1.5
MAX DEPTH**	4	0.020-0.040	0.020	9.4- 23.8	4	0.120-0.240	0.170	5.8- 24.7	4	0.120-0.230	0.165	3.0- 22.9
AMMONIA (MG/L)												
0.-1.5 M DEPTH	8	0.020-0.040	0.020	0.0- 1.5	8	0.020-0.020	0.020	0.0- 1.5	8	0.020-0.020	0.020	0.0- 1.5
MAX DEPTH**	4	0.040-0.070	0.060	9.4- 23.8	4	0.020-0.200	0.045	5.8- 24.7	4	0.020-0.030	0.020	3.0- 22.9
KJELDAHL N (MG/L)												
0.-1.5 M DEPTH	8	0.200-0.800	0.400	0.0- 1.5	8	0.400-0.500	0.400	0.0- 1.5	8	0.200-0.600	0.300	0.0- 1.5
MAX DEPTH**	4	0.400-0.600	0.400	9.4- 23.8	4	0.400-0.600	0.450	5.8- 24.7	4	0.200-0.400	0.250	3.0- 22.9
SECCHI DISC (METERS)												
	4	0.3- 1.1	0.9		4	0.2- 1.2	0.6		4	0.2- 0.6	0.4	

* N = NO. OF SAMPLES
** MAXIMUM DEPTH SAMPLED AT EACH SITE
*** S = NO. OF SITES SAMPLED ON THIS DATE

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
05/02/75	1. Stephanodiscus	722
	2. Chroomonas ?	611
	3. Coelastrum	56
	4. Ankistrodesmus	56
	Other genera	--
	Total	1,445
08/19/75	1. Stephanodiscus	437
	2. Carteria	328
	3. Chroomonas ?	273
	4. Microcystis	109
	5. Schroederia	109
	Other genera	300
	Total	1,556
10/03/75	1. Pennate diatom	41
	2. Chroomonas ?	21
	Other genera	--
	Total	62

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/02/75	01	5.1
	02	7.2
	03	7.4
	04	9.7
	05	---
	06	---
08/19/75	01	7.8
	02	11.2
	03	---
	04	---
	05	9.4
	06	9.7
10/03/75	01	1.3
	02	1.9
	03	---
	04	---
	05	3.6
	06	6.8

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum Yield (mg/l-dry wt.)
a. 05/02/75			
Control	0.020	0.025	2.4
0.05 P	0.070	0.025	2.4
0.05 P + 1.0 N	0.070	1.025	20.5
1.00 N	0.020	1.025	7.6
b. 10/03/75			
Control	0.030	0.230	10.6
0.05 P	0.080	0.230	12.7
0.05 P + 1.0 N	0.080	1.230	16.9
1.00 N	0.030	1.230	9.3

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential for primary production in Elephant Butte Reservoir was high at both times of sample collection (05/02/75, 10/03/75). In the May assay, the significant increase in yield over that of the control produced by the addition of nitrogen as well as the lack of increase with the addition of only phosphorus indicates nitrogen limitation. In the October assay, phosphorus limitation is suggested; spikes of phosphorus produced a slight growth increase while nitrogen spikes alone did not stimulate growth beyond the control yield.

In both assays, maximum yield was achieved by the simultaneous addition of both nutrients.

The mean inorganic nitrogen to orthophosphorus (N/P) ratios in the lake data were 3/1 or less on all sampling occasions suggesting primary limitation by nitrogen (a mean N/P ratio of 14/1 or greater generally reflects phosphorus limitation).

IV. NUTRIENT LOADINGS
(See Appendix D for data)

For the determination of nutrient loadings, the New Mexico National Guard collected a number of monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of April and May when two samples were collected. Sampling was begun in December 1974, and was completed in November 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the New Mexico District Office of the USGS for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries except Unnamed Stream, E-1 were determined by using a modification of a USGS computer program for calculating stream loadings. Nutrient loads indicated for tributaries are those measured minus known point source loads, if any.

Nutrient loadings for Unnamed Stream, Station E-1 and "minor tributaries and immediate drainage" ("ZZ" of USGS) were estimated by multiplying the mean annual concentrations in Unnamed Stream at Station E-1 by the appropriate mean annual flow.

The operators of the Albuquerque (2 plants), Belen, and Los Lunas wastewater treatment plants provided monthly effluent samples

and corresponding flow data. Nutrient loads for the Socorro wastewater plant were calculated based upon provided monthly effluent samples and estimated flow (0.3785 m^3/capita/day).

A. Waste Sources:

1. Known municipal -

Name	Pop.* Served	Treatment*	Mean Flow ($m^3/d \times 10^3$)	Receiving Water
Socorro	5,000	Trickling Filter	1.892**	Luis Lopez Drain to Rio Grande
Albuquerque #1	130,000	Trickling Filter	73.127	Rio Grande
Albuquerque #2	140,000	Trickling Filter	67.243	Rio Grande
Belen	6,500	Trickling Filter	3.189	Basque Drain to Rio Grande
Los Lunas	1,800	Trickling Filter	1.126	Rio Grande

2. Known industrial - None

*Treatment plant operators.
**Estimated at 0.3785 m^3/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/yr	% of total
a. Tributaries (nonpoint load) -		
A-2 Rio Grande	2,025,735	78.8
B-1 Alamosa River	?	--
C-1 Unnamed Tributary	100	<0.1
E-1 Unnamed Stream	5	<0.1
b. Minor tributaries and immediate drainage (nonpoint load) -	475	<0.1
c. Known municipal STP's -		
Socorro	6,870	0.3
Albuquerque #1	270,655	10.5
Albuquerque #2	250,255	9.7
Belen	7,890	0.3
Los Lunas	4,690	0.2
d. Septic tanks* -	5	<0.1
e. Known industrial - None		
f. Direct precipitation** -	2,590	0.1
Total	2,569,270	100.0%
2. Outputs - A-1 Rio Grande	83,595	
3. Net annual P accumulation -	2,485,675	

*Estimate based on 14 lakeshore residences.
**Estimated (See NES Working Paper No. 175).

C. Annual Total Nitrogen Loading - Average Year

1. Inputs -

Source		kg N/yr	% of total
a.	Tributaries (nonpoint load) -		
	A-2 Rio Grande	5,614,370	77.5
	B-1 Alamosa River	?	---
	C-1 Unnamed Tributary	4,315	0.1
	E-1 Unnamed Stream	235	<0.1
b.	Minor tributaries and immediate drainage (nonpoint load) -	25,340	0.4
c.	Known municipal STP's -		
	Socorro	17,790	0.2
	Albuquerque #1	755,670	10.4
	Albuquerque #2	639,040	8.8
	Belen	21,700	0.3
	Los Lunas	6,280	0.1
d.	Septic tanks* -	150	<0.1
e.	Known industrial - None		
f.	Direct precipitation** -	159,835	2.2
	Total	7,244,725	100.0%
2.	Outputs - A-1 Rio Grande	1,141,900	
3.	Net annual N accumulation -	6,102,825	

*Estimate based on 14 lakeshore residences.
**Estimated (See NES Working Paper No. 175).

D. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

Tributary	kg P/km^2/yr	kg N/km^2/yr
Rio Grande	28	78
Unnamed Tributary (C-1)	18	757
Unnamed Stream (E-1)	<1	6

E. Mean Nutrient Concentrations in Ungaged Streams:

Tributary	Mean Total P (mg/l)	Mean Total N (mg/l)
D-1 Rio Grande Conveyance Canal	0.883	2.588

F. Yearly Loadings:

In the following table, the existing phosphorus annual loading is compared to the relationship proposed by Vollenweider (1975). Essentially, his "eutrophic" loading is that at which the receiving waters would become eutrophic or remain eutrophic; his "oligotrophic" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A "mesotrophic" loading would be considered one between "eutrophic" and "oligotrophic".

Note that Vollenweider's model may not apply to lakes with short hydraulic retention times or in which light penetration is severely restricted by high concentrations of suspended solids in the surface waters.

	Total Yearly Phosphorus Loading ($g/m^2/yr$)
Estimated loading for Elephant Butte Reservoir	17.35
Vollenweider's "eutrophic" loading	0.56
Vollenweider's "oligotrophic" loading	0.28

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX B

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR NEW MEXICO 03/08/77

LAKE CODE 3505 ELEPHANT BUTTE RESERVOIR

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 76275.4

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3505A1	76275.4	18.07	22.14	27.38	54.76	112.16	93.81	33.81	22.74	17.47	20.10	17.78	18.94	38.31
3505A2	71742.9	17.27	21.52	26.62	53.24	109.02	91.18	32.56	21.24	16.71	19.26	17.27	18.41	37.07
350581	1745.7	0.085	0.045	0.045	0.065	0.040	0.068	0.283	0.680	0.224	0.238	0.022	0.040	0.154
3505C1	5.7	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.0	0.0	0.000
3505E1	41.3	0.0	0.000	0.001	0.001	0.001	0.0	0.019	0.023	0.008	0.007	0.001	0.0	0.005
3505ZZ	2737.6	0.51	0.62	0.76	1.53	3.14	2.63	0.96	0.65	0.48	0.57	0.51	0.54	1.08

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 76275.4
SUM OF SUB-DRAINAGE AREAS = 76273.1

TOTAL FLOW IN = 459.10
TOTAL FLOW OUT = 459.19

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3505A1	12	74	0.190	7	0.139				
	1	75	2.775	5	0.280				
	2	75	0.481	2	0.156				
	3	75	40.493	1	0.396				
	4	75	52.386	4	61.164	19	51.253		
	5	75	51.537	1	48.705	17	52.103		
	6	75	51.253	7	56.067				
	7	75	47.006	8	46.723				
	8	75	38.794	2	47.289				
	9	75	9.854	6	23.899				
	10	75	0.229	4	0.170				
	11	75	1.501	1	0.340				
3505A2	12	74	3.964	7	13.451				
	1	75	14.158	4	12.743				
	2	75	22.087	1	18.802				
	3	75	16.707	1	19.312				
	4	75	10.477	4	0.0	19	0.0		
	5	75	74.473	1	97.693	17	69.943		
	6	75	55.218	7	54.935				
	7	75	30.582	8	39.360				
	8	75	4.021	1	0.0				
	9	75	31.998	6	75.606				
	10	75	0.054	4	0.0				
	11	75	0.680	1	0.0				

AIMD WOLF YRATSIRIST
BOMBAY

TRIBUTARY FLOW INFORMATION FOR NEW MEXICO 03/08/77

LAKE CODE 3505 ELEPHANT BUTTE RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
350581	12	74	0.003						
	1	75	0.071						
	2	75	0.045						
	3	75	0.040						
	4	75	0.042						
	5	75	0.034						
	6	75	0.057	7	0.057				
	7	75	0.538	8	0.680				
	8	75	0.283						
	9	75	0.510	6	0.0				
	10	75	0.057	4	0.0				
	11	75	0.051	1	0.0				
3505C1	12	74	0.000	7	0.000				
	1	75	0.000	5	0.000				
	2	75	0.000	2	0.000				
	3	75	0.000						
	4	75	0.000						
	5	75	0.000						
	6	75	0.000	7	0.000				
	7	75	0.001	8	0.002				
	8	75	0.001						
	9	75	0.113	6	0.0				
	10	75	0.011	4	0.0				
	11	75	0.006	2	0.0				
3505D1	12	74	0.0	7	0.0				
	1	75	0.0	4	0.0				
	2	75	0.0	1	0.0				
	3	75	6.513	1	0.0				
	4	75	23.220	4	10.024	19	24.919		
	5	75	19.255	1	25.655	17	18.293		
	6	75	20.671	7	21.124				
	7	75	30.299	8	34.547				
	8	75	15.097	1	11.157				
	9	75	5.437	6	4.474				
	10	75	14.959	4	4.984				
	11	75	39.644	1	7.249				
3505E1	12	74	0.0	7	0.0				
	1	75	0.0	5	0.0				
	2	75	0.000	2	0.000				
	3	75	0.001	1	0.001				
	4	75	0.000	4	0.0				
	5	75	0.001						
	6	75	0.0	6	0.0				
	7	75	0.037	8	0.048				
	8	75	0.010						
	9	75	0.020	6	0.0				
	10	75	0.002	4	0.0				
	11	75	0.001	2	0.0				

23

TRIBUTARY FLOW INFORMATION FOR NEW MEXICO 03/08/77

LAKE CODE 3505 ELEPHANT BUTTE RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3505ZZ	12	74	0.116						
	1	75	0.425						
	2	75	0.651						
	3	75	0.680						
	4	75	0.963						
	5	75	2.690						
	6	75	2.180						
	7	75	1.812						
	8	75	0.280						
	9	75	1.104						
	10	75	0.139						
	11	75	1.189						

APPENDIX C

PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

350501
33 09 17.0 107 11 28.0 3
ELEPHANT BUTTE RESERVOIR
35051 NEW MEXICO

/TYPA/AMBNT/LAKE

11EPALES 760109 04001002
0082 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/02	11 20	0000	12.7	9.8	42	573	8.65	161	0.020	0.400	0.020K	0.018
	11 20	0005	12.9	9.0		689	8.70	162	0.020	0.400	0.020K	0.018
	11 20	0015	11.9	8.4		671	8.65	161	0.020	0.400	0.020K	0.020
	11 20	0035	11.3	8.6		659	8.60	161	0.020	0.400	0.020K	0.019
	11 20	0055	10.7	7.6		657	8.50	161	0.020	0.400	0.020K	0.024
	11 20	0078	10.5	7.0		719	8.40	158	0.030	0.400	0.020K	0.031
75/08/19	14 30	0000	25.5	7.0	48	631	8.40	123	0.060	0.400	0.020K	0.032
	14 30	0005	25.0	5.8		624	8.45	123	0.020K	0.400	0.020K	0.033
	14 30	0015	24.8	5.8		619	8.35	122	0.020K	0.400	0.020K	0.038
	14 30	0045	23.6	1.6		609	7.95	126	0.020	0.400	0.020K	0.090
	14 30	0081	20.9			595	7.65	136	0.200	0.600	0.220	0.190
75/10/03	15 15	0000	21.6	6.2	24	566	7.80	131	0.020K	0.200	0.120	0.065
	15 15	0005	21.0	5.4		551	7.90	132	0.020K	0.200	0.230	0.064
	15 15	0015	20.9	4.8		544	7.90	134	0.020K	0.200	0.240	0.071
	15 15	0045	20.8	5.2		544	7.90	134	0.020K	0.400	0.250	0.074
	15 15	0075	20.7	5.4		544	8.05	135	0.020K	0.300	0.250	0.128

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/02	11 20	0000	0.051	5.1	
	11 20	0005	0.051		
	11 20	0015	0.048		30
	11 20	0035	0.042		
	11 20	0055	0.054		
	11 20	0078	0.097		
75/08/19	14 30	0000	0.067	7.8	
	14 30	0005	0.062		
	14 30	0015	0.062		
	14 30	0045	0.102		
	14 30	0081	0.203		
75/10/03	15 15	0000	0.083	1.3	
	15 15	0005	0.085		
	15 15	0015	0.083		
	15 15	0045	0.081		
	15 15	0075	0.087		

K VALUE KNOWN TO BE LESS

NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

350502
33 10 48.0 107 11 46.0 3
ELEPHANT BUTTE RESERVOIR
35051 NEW MEXICO

/TYPA/AMBNT/LAKE 11EPALES 760109 04001002
0072 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/02	10 45	0000	12.4	8.4	36	568	8.70	164	0.040	0.700	0.020K	0.026
	10 45	0005	12.3	8.8		665	8.70	163	0.020	0.200	0.020K	0.021
	10 45	0015	11.7	8.4		658	8.70	161	0.030	0.200	0.020K	0.031
	10 45	0040	11.3	7.6		646	8.60	163	0.030	0.200	0.020K	0.024
	10 45	0068	10.9	6.6		657	8.50	160	0.060	0.400	0.020K	0.023
75/08/19	16 05	0000	25.8	8.0	30	626	8.55	121	0.020K	0.400	0.020K	0.045
	16 05	0005	25.2	7.0		625	8.60	121	0.020	0.500	0.040	0.048
	16 05	0015	24.2	5.4		611	8.45	121	0.020	0.400	0.070	0.059
	16 05	0030	24.0	5.2		610	8.30	119	0.060	0.400	0.070	0.066
	16 05	0063	21.8	0.8		590	7.90	128	0.060	0.400	0.240	0.140
75/10/03	15 00	0000	21.0	6.2	15	544	8.15	131	0.020K	0.200	0.200	0.060
	15 00	0005	20.7	6.8		544	8.20	132	0.020K	0.200	0.200	0.067
	15 00	0015	20.7	5.8		541	8.20	134	0.020K	0.200	0.190	0.065
	15 00	0045	20.6	5.8		540	8.20	132	0.020K	0.200	0.190	0.062
	15 00	0075	20.5	5.6		544	8.20	132	0.020K	0.200	0.190	0.063

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/02	10 45	0000	0.049	7.2	
	10 45	0005	0.048		
	10 45	0015	0.047		
	10 45	0040	0.053		
	10 45	0068	0.098		
75/08/19	16 05	0000	0.098	11.2	
	16 05	0005	0.086		
	16 05	0015	0.092		
	16 05	0030	0.094		
	16 05	0063	0.158		
75/10/03	15 00	0000	0.081	1.9	
	15 00	0005	0.083		
	15 00	0015	0.083		
	15 00	0045	0.081		
	15 00	0075	0.087		

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

350503
33 12 23.0 107 11 35.0 3
ELEPHANT BUTTE RESERVOIR
35051 NEW MEXICO

/TYPA/AMBNT/LAKE

11EPALES 760109 04001002
0064 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/02	14 25	0000	13.2	9.2	38	600	8.80	160	0.030	0.800	0.020K	0.028
	14 25	0005	13.1	9.0		600	8.80	161	0.020K	0.400	0.020K	0.024
	14 25	0015	12.2	8.6		584	8.80	161	0.020K	0.300	0.020K	0.025
	14 25	0035	11.8	8.0		580	8.70	161	0.020	0.300	0.020K	0.027
	14 25	0060	11.3	7.2		573	8.80	160	0.040	0.400	0.020K	0.030

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/02	14 25	0000	0.064	7.4	
	14 25	0005	0.052		
	14 25	0015	0.057		
	14 25	0035	0.048		
	14 25	0060	0.052		

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

350504
33 16 13.0 107 09 45.0 3
ELEPHANT BUTTE RESERVOIR
35051 NEW MEXICO

/TYPA/AMBNT/LAKE

11EPALES 760109 04001002
0035 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/02	15 00	0000	14.0	8.2	12	565	8.90	157	0.020K	0.600	0.020K	0.047
	15 00	0005	13.7	7.6		565	8.70	149	0.040	0.400	0.110	0.069
	15 00	0015	13.7	7.6		577	8.70	150	0.040	0.400	0.100	0.070
	15 00	0031	12.9	7.2		610	8.60	161	0.070	0.600	0.040	0.043

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/02	15 00	0000	0.084	9.7	
	15 00	0005	0.111		
	15 00	0015	0.097		
	15 00	0031	0.129		

K VALUE KNOWN TO BE LESS
THAN INDICATED

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

350505
33 12 51.0 107 09 48.0 3
ELEPHANT BUTTE RESERVOIR
35051 NEW MEXICO

/TYPA/AMBNT/LAKE

11EPALES 760109 04001002
0052 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/08/19	15 40	0000	26.3	8.2	18	633	8.60	127	0.020K	0.400	0.020K	0.045
	15 40	0005	25.3	7.0		621	8.70	119	0.020K	0.400	0.040	0.047
	15 40	0015	24.7	5.4		624	8.50	120	0.020K	0.300	0.080	0.059
	15 40	0030	24.3	3.6		629	8.20	122	0.020K	0.400	0.190	0.084
	15 40	0048	23.6	2.0		614	8.00	127	0.020K	0.500	0.720	0.120
75/10/03	14 45	0000	20.9	7.0	14	546	8.40	129	0.020K	0.400	0.150	0.054
	14 45	0005	20.8	6.0		545	8.35	132	0.020K	0.400	0.160	0.056
	14 45	0015	20.6	6.2		544	8.40	132	0.030	0.400	0.130	0.057
	14 45	0035	20.6	6.4		551	8.40	134	0.040	0.500	0.140	0.062
	14 45	0051	20.5	6.4		568	8.40	133	0.030	0.200	0.140	0.058

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/08/19	15 40	0000	0.118	9.4	
	15 40	0005	0.082		
	15 40	0015	0.099		
	15 40	0030	0.120		
	15 40	0048	0.171		
75/10/03	14 45	0000	0.083	3.6	
	14 45	0005	0.080		
	14 45	0015	0.084		
	14 45	0035	0.086		
	14 45	0051	0.092		

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

350506
33 17 42.0 107 09 27.0 3
ELEPHANT BUTTE RESERVOIR
35051 NEW MEXICO

/TYPA/AMBNT/LAKE

11EPALES 760109 04001002
0023 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/08/19	15	20 0000	26.3	7.0	6	667	8.60	129	0.020K	0.400	0.080	0.056
	15	20 0005	26.0	6.4		650	8.60	132	0.020K	0.400	0.100	0.062
	15	20 0019	24.5	5.4		677	8.45	134	0.030	0.400	0.120	0.073
75/10/03	14	20 0000	21.6	8.4	8	562	8.60	127	0.020K	0.600	0.090	0.038
	14	20 0005	21.5	8.0		559	8.60	130	0.020K	0.400	0.120	0.050
	14	20 0010	20.6	7.0		681	8.50	133	0.020K	0.400	0.120	0.050

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT RFMNING PERCENT
75/08/19	15	20 0000	0.097	9.7	
	15	20 0005	0.110		
	15	20 0019	0.102		
75/10/03	14	20 0000	0.078	6.8	
	14	20 0005	0.098		
	14	20 0010	0.109		

K VALUE KNOWN TO BE LESS THAN INDICATED

APPENDIX D

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3505A1
33 09 12.0 107 11 30.0 4
RIO GRANDE
35 7.5 ELPHNT BUTTE
O/ELEPHANT BUTTE RES 120991
BELO DAM 3.2 MI NE OF TRUTH OR CONSQUECS
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/07	11	45	0.032	0.700	0.060	0.020	0.080
75/01/05			0.068	0.700	0.032	0.012	0.035
75/02/02	10	45	0.008	1.100	0.024	0.005	0.030
75/03/01	16	30	0.005	0.350	0.045	0.010	0.020
75/04/04	09	50	0.010	0.350	0.020	0.015	0.030
75/04/19	17	00	0.005	0.400	0.020	0.020	0.040
75/05/01	15	20	0.005	0.650	0.030	0.020	0.050
75/05/17	16	15	0.005	2.400	0.050	0.025	0.040
75/06/07	10	00	0.015	0.450	0.085	0.035	0.060
75/07/08	12	40	0.200	1.100	0.035	0.075	0.130
75/08/02	14	20	0.210	0.450	0.055	0.120	0.120
75/09/06	14	00	0.080	0.400	0.070	0.100	0.130
75/10/04	09	08	0.240	0.600	0.035	0.075	0.210
75/11/01	10	30	0.220	1.200	0.035	0.060	0.130
75/11/02	10	30	0.165	0.700	0.015	0.105	0.420

NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3505A2
33 41 10.0 106 59 10.0 4
RIO GRANDE
35 SOCORRO CO NAP
T/ELEPHANT BUTTE RES 120991
RR BRDG 1 MI S OF SAN MARCIAL
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/07	15	00	0.570	2.050	0.080	0.410	1.450
75/01/04	11	30	0.360	2.200	0.288	0.405	1.512
75/02/01	10	30	0.672	2.200	0.072	0.375	1.350
75/03/01	11	30	0.630	2.500	0.105	0.420	1.000
75/05/01	09	50	0.330	6.000	0.032	0.505	3.100
75/05/17	11	30	0.310	4.400	0.070	1.950	4.100
75/06/07	14	00	0.290	1.000	0.025	0.150	0.800
75/09/06	09	30	0.010	22.000	0.680	0.005	

34

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3505C1
33 08 42.0 107 09 37.0 4
UNNAMED TRIBUTARY
35 7.5 ELPHNT BUTTE
T/ELEPHANT BUTTE RES 120991
JOSE CYN BNK .5 MI N OF HWY 52
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/07	10	30	0.016	0.900	0.020	0.020	0.025
75/01/05			0.096	0.200	0.008	0.017	0.035
75/02/02	09	45	0.112	0.300	0.008K	0.020	0.025

K VALUE KNOWN TO BE LESS THAN INDICATED

35

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3505D1
33 41 30.0 106 59 00.0 4
RIO GRANDE CONVEYANCE CHANNEL
35 SOCORRO CO MAP
T/ELEPHANT BUTTE RES 120991
NEW BRDG 1 MI S OF SAN MARCIAL
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/04/04	06 30		0.490	2.500	0.030	0.330	0.850
75/04/19	10 50		0.525	1.700	0.030	0.270	0.980
75/05/01	09 00		0.315	3.300	0.025	0.150	1.800
75/05/17	13 00		0.200	3.600	0.025	0.135	1.150
75/06/07	14 30		0.195	1.150	0.025	0.145	0.650
75/07/08	10 40		0.210	1.300	0.010	0.155	0.540
75/08/01	12 00		0.260	4.100	0.025	0.135	
75/09/06	10 00		0.070		0.020	0.090	
75/10/04			0.055	0.800	0.015	0.075	0.210

STORET RETRIEVAL DATE 76/12/16
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3505E1
33 08 05.0 107 10 45.0 4
UNNAMED STREAM
35 7.5 ELPHNT BUTTE
T/ELEPHANT BUTTE RES 120991
HWY 52 XING 1.3 MI SSE OF WTR TANK HILL
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/12/07	09	30	0.016	0.600	0.010		0.010K
75/01/05			0.016	0.667	0.008	0.012	0.017
75/02/02	08	45	0.008	1.700	0.008	0.010	0.010
75/03/01	10	00	0.005	0.400	0.030		0.020
75/04/04	09	30	0.007	0.300	0.015	0.010	0.010

K VALUE KNOWN TO BE LESS
THAN INDICATED

37

STORET RETRIEVAL DATE 77/02/18
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

/AMBNT/STREAM

3505AA TF3505AA P005000
34 03 29.0 106 52 46.0 4
SOCORRO
35 7.5 SOCORRO
T/ELEPHANT BUTTE RES. 120491
LUIS LOPEZ DRAIN TO RIO GRANDE
11EPALES 00001004
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/12/03	08	25	0.274	27.000	12.500	8.750	9.000		
75/01/06	08	30	0.080	34.000	17.300	9.000	12.500		
75/02/06	08	36	0.080	15.000	12.400	8.400	8.800		
75/03/04	08	20	0.080	31.000	12.000		9.500		
75/04/01	08	10	0.080	27.000	11.800	8 350	10.500		
75/05/22	08	30	0.200	20.000	9.600	8.500	8.400		
75/06/23	14	00	0.100	28.000	10.000	8.700	10.000		
75/07/19			0.025	23.000	8.000	10.000	10.800		

STORET RETRIEVAL DATE 77/02/14
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

/AMBNT/STREAM

3505AB TF3505AB =130000
35 01 10.0 106 40 00.0 4
ALBUQUERQUE =1
35 7.5ALBUQUERQUE =
T/ELEPHANT BUTTE RES. 120991
RIO GRANDE
11EPALES 00001004
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/12/16	10 00								
CP(T)-			0.160	27.000	12.000	9.400		22.800	25.700
74/12/17	06 00								
75/01/22	00 00								
CP(T)-			0.080	35.000			10.500	12.800	13.700
75/01/22	24 00								
75/02/24	10 00								
CP(T)-			0.080	28.500	12.000	9.110	11.000	18.600	18.200
75/02/25	06 00								
75/03/12	10 00								
CP(T)-			0.080	33.000	14.400	8.000	9.900	20.300	20.200
75/03/13	06 00								
75/04/21	10 00								
CP(T)-			0.050	33.000	12.500		12.000	21.200	21.000
75/04/22	06 00								
75/05/26	10 00								
CP(T)-			0.200	19.000	10.500	9.400	9.400	13.800	17.900
75/05/27	06 00								
75/07/30	10 00								
CP(T)-			0.050	25.000	4.200	3.600	9.000	15.800	17.700
75/07/31	06 00								
75/09/08	10 00								
CP(T)-			0.075	23.000	9.300	8.100	10.000	20.800	19.200
75/09/09	06 00								
75/09/29	10 00								
CP(T)-			0.075	28.000	11.000	9.000	10.500	21.800	22.500
75/09/30	06 00								
75/10/08	00 00								
CP(T)-			0.075	29.000	11.000	8.000	9.700	16.000	16.400
75/10/09	00 00								
75/11/24	10 00								
CP(T)-			0.025	29.000	9.100	9.200	12.000		20.000
75/11/25	06 00								

STORET RETRIEVAL DATE 77/02/18
NATL EUTHOPHICATION SURVEY
EPA- LAS VEGAS

3505AC TF3505AC P140000
35 03 45.0 106 39 15.0 4
ALBUQUERQUE #2
35 7.5ALBUQUERQUE W
T/ELEPHANT BUTTE RES. 120991
RIO GRANDE
11EPALES 00001004
0000 FEET DEPTH CLASS 00

/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/12/16	10 00								
CP(T)-			0.160	27.000	14.500	9.900		20.000	20.000
74/12/17	06 00								
75/01/22	00 00								
CP(T)-			0.080	32.000	15.200		11.500	18.700	19.400
75/01/22	24 00								
75/02/24	10 00								
CP(T)-			0.240	29.000	14.400	6.200	10.500	18.600	18.900
75/02/25	06 00								
75/03/12	10 00								
CP(T)-			0.240	31.000	15.200	8.100	9.700	19.100	18.800
75/03/13	06 00								
75/04/21	10 00								
CP(T)-			0.200	37.000	18.800	11.000	14.000	14.000	18.000
75/04/22	06 00								
75/05/26	10 00								
CP(T)-			0.150	12.000	4.200	6.100	7.200	18.800	17.500
75/05/27	06 00								
75/07/30	10 00								
CP(T)-			0.200	23.000	9.000	8.180	9.000	20.800	20.600
75/07/31	06 00								
75/09/08	10 00								
CP(T)-			0.350	22.000	9.950	9.625	10.000	11.500	15.400
75/09/09	06 00								
75/09/29	10 00								
CP(T)-			0.150	26.000	10.500	10.000	11.800	15.000	14.300
75/09/30	06 00								
75/10/08	10 00								
CP(T)-			0.325	22.000	8.600	8.800	9.800	16.000	16.300
75/10/09	06 00								
75/11/24	10 00								
CP(T)-			0.075	24.000	15.000	9.500	11.000	16.500	16.200
75/11/25	06 00								

40

STORET RETRIEVAL DATE 77/02/15
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3505AD TF3505AD P006500
34 34 29.0 106 46 19.0 4
BELEN
35 7.5 BELEN
T/ELEPHANT BUTTE RES. 120991
BOSQUE DRAIN TO RIO GRANDE
11EPALES 00001004
0000 FEET DEPTH CLASS 00

/ANHNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/12/02	09 00		2.320	16.000	1.600	6.700	9.700	0.600	0.600
75/01/01	09 00		1.680	16.000	2.200	6.900	8.450	0.600	0.700
75/02/01	09 00		3.120	24.000	6.600	5.300	7.700	0.600	0.700
75/03/03	09 00		0.080	14.500			6.700	0.600	0.700
75/03/31	10 30		2.000	16.000	2.700	4.320	5.500	0.600	0.700
75/04/30	13 00		0.750	30.000	6.000	5.600	8.700	0.600	0.700
75/05/30			0.750	15.500	1.050	5.850	5.850	0.760	0.700
75/07/01	10 00		0.750	12.500	0.210	4.400	5.300	0.760	0.700
75/08/01	10 00		1.400	15.500	0.225	4.700	5.650	0.760	0.785
75/08/29	10 00		1.500	12.500	0.260	4.000	4.700	0.760	0.786
75/10/01	10 00		1.880	11.500	0.050	4.700	5.100	0.760	0.760
75/10/31	14 00		1.700	19.000	4.100	5.100	6.200	0.760	2.360
75/11/30	14 00		1.570	19.000	0.240	5.900	7.800	2.280	0.760

STORET RETRIEVAL DATE 77/02/18
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3505AE TF3505AE P001N00
34 48 03.0 106 43 09.0 4
LOS LUNAS
35 7.5 LOS LUNAS
T/ELEPHANT BUTTE RES. 120991
RIO GRANDE
11EPALES 00001004
0000 FEET DEPTH CLASS 00

/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/12/03	09 00								
CP(T)-			17.600	4.200	0.110	14.500	14.500	0.250	0.250
74/12/03	16 00								
75/01/03	09 00								
CP(T)-			13.600	3.750	0.110	10.500	12.300	0.200	0.250
75/01/03	16 00								
75/02/03	09 00								
CP(T)-			13.600	1.000K	0.240	10.000	10.000	0.250	0.320
75/02/03	16 00								
75/03/03	09 00								
CP(T)-			17.600	1.200	0.080K	13.700	14.000	0.330	0.330
75/03/03	16 00								
75/04/07	09 00								
CP(T)-			1.920	1.600	0.200		13.000	0.250	0.250
75/04/07	16 00								
75/05/08	09 00								
CP(T)-			16.500	1.900	0.050K	10.000	11.300	0.320	0.300
75/05/08	16 00								
75/07/07	09 00								
CP(T)-			7.300	4.800	0.060	8.300	8.700	0.340	0.340
75/07/07	16 00								
75/08/26	09 00								
CP(T)-			14.000	1.200	0.037	8.600	8.600	0.320	0.340
75/08/26	16 00								

APPENDIX E

PARAMETRIC RANKINGS OF LAKES SAMPLED BY NES IN 1975

STATE OF NEW MEXICO

Mean or median values for six of the key parameters evaluated in establishing the trophic conditions of New Mexico lakes sampled are presented to allow direct comparison of the ranking, by parameter, of each lake relative to the others. Median total phosphorus, median inorganic nitrogen and median dissolved orthophosphorus levels are expressed in mg/l. Chlorophyll a values are expressed in µg/l. To maintain consistent rank order with the preceding parameters, the mean Secchi disc depth, in inches, is subtracted from 500. Similarly, minimum dissolved oxygen values are subtracted from 15 to create table entries.

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
0812	NAVAJO RESERVOIR	0.025	0.130	420.928	2.164	11.200	0.009
3501	ALAMOGORDO	0.025	0.050	469.667	5.867	10.600	0.003
3502	BLUE WATER LAKE	0.036	0.140	480.125	3.867	11.400	0.012
3503	CONCHAS RESERVOIR	0.020	0.040	451.833	3.275	14.400	0.004
3504	EAGLE NEST LAKE	0.181	0.070	455.750	13.357	14.400	0.132
3505	ELEPHANT BUTTE RESERVOIR	0.083	0.110	475.750	6.758	14.200	0.052
3506	EL VADO RESERVOIR	0.034	0.140	466.444	2.189	12.600	0.014
3507	LAKE MACMILLAN	0.097	0.045	489.778	14.133	10.100	0.009
3509	UTE RESERVOIR	0.021	0.040	448.750	3.242	13.800	0.004

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
0812	NAVAJO RESERVOIR	63 (5)	25 (2)	100 (8)	100 (8)	75 (6)	56 (4)
3501	ALAMOGORDO	75 (6)	63 (5)	38 (3)	38 (3)	88 (7)	100 (8)
3502	BLUE WATER LAKE	38 (3)	6 (0)	13 (1)	50 (4)	63 (5)	38 (3)
3503	CONCHAS RESERVOIR	100 (8)	94 (7)	75 (6)	63 (5)	6 (0)	81 (6)
3504	EAGLE NEST LAKE	0 (0)	50 (4)	63 (5)	13 (1)	6 (0)	0 (0)
3505	ELEPHANT BUTTE RESERVOIR	25 (2)	38 (3)	25 (2)	25 (2)	25 (2)	13 (1)
3506	EL VADO RESERVOIR	50 (4)	6 (0)	50 (4)	88 (7)	50 (4)	25 (2)
3507	LAKE MACMILLAN	13 (1)	75 (6)	0 (0)	0 (0)	100 (8)	56 (4)
3509	UTE RESERVOIR	88 (7)	94 (7)	88 (7)	75 (6)	38 (3)	81 (6)